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A BRIEF ACCOUNT OF AESTIVATION AND OVERWINTERING OF THE OCCIDENT ANT, POGONOMYRMEX OCCIDENTALIS CRESSON, IN IDAHO.

BY A. C. COLE, JR.
Twin Falls, Idaho.

INTRODUCTION.

The phenomena of aestivation and overwintering of ants present a most interesting study. The similarities between the two as well as their many differences offer excellent comparisons. Little work has actually been accomplished with ants in this field in spite of the studies of arthropod hibernation instigated by Holmquist (1)[1] and others. The purpose of this paper is to present some of the more important physical and biotic factors involved in the aestivation and overwintering periods of the Occident ant, *Pogonomyrmex occidentalis* Cresson, in a portion of the Northern Desert Shrub region, near Twin Falls, Idaho.

THE AESTIVATION PERIOD.

In southern Idaho, on a typical summer day, that is, one without rain, heavy clouds or excessively low temperatures, *P. occidentalis* aestivates within its nests from approximately 11 a. m. until 2 p. m. During this period no activity of the ants occurs on or away from the mounds.[2] Externally the nests appear to be deserted. Activity, however slight, presides within the nests, especially in the chambers of lowest depth, as the writer has observed on many occasions. The nest entrances remain open.

The influence of temperature upon aestivation. The highest temperatures during the summer day normally occur during the period from 11 a. m. to 3 p. m., the maximum usually being near the latter hour. At this time July atmospheric temperatures of 95° to 100°F. are not uncommon and the soil surface temperatures range between 120° and 140°F. In so far as the writer has been able to determine from repeated observations of large samples of mounds near Twin Falls, aestivation of *P. occidentalis* begins when the soil surface temperature reaches a level of approximately 118°F. Activity gradually ceases from a temperature of 110°F. to the threshhold of total aestivation.

If mounds are opened at soil surface temperatures above 118°F, and the ants placed either on the mounds or in the denuded areas, they hastily enter their nests and retreat to the deeper subterranean chambers where much cooler temperatures prevail. There they remain until the soil surface temperature falls to the activity level, at which time they desert the nests in ever increasing numbers to begin harvesting.

The writer believes that while temperature alone may not explain the phenomenon of aestivation, it is, however, the most important of a relatively

[1]Numbers in parenthesis refer to the literature cited.
[2]Apparently this observation is contrary to that of McCook (2).

small group of interrelated factors.

On a cool and cloudy summer day, with a maximum soil surface temperature of about 105°F., *P. occidentalis* does not enter a state of aestivation. Often, harvesting activity is greatest from 1 p. m. to 3 p. m., but this is true only when the day is abnormally cool and soil surface temperatures are correspondingly lower. On days with high maximum temperatures, greatest harvesting activity is between 5 a. m. and 10 a. m., with its peak at about 8 a. m., although at times another period, that from 3 p. m. to 9 p. m., predominates, its peak being at about 7 p. m.

In general, harvesting activity of the ant continues from daylight to dusk or after, except for the relatively short period of aestivation.

THE OVERWINTERING PERIOD.

The overwintering period of *P. occidentalis*, which does not represent true hibernation because of constant feeding activity within the nests throughout the winter, lasts, on the average, from the middle or end of October to the middle of the following March. During this entire period the ants are in a semi-comatose state and they do not leave their nests.

External aspects of the nest. At the beginning of the overwintering period the entrances to the nest are closed by the worker ants with small pebbles, sand or bits of earth. During severe winters many mounds are partially levelled or completely destroyed by the forces of Nature, especially where there is likely to be a wash of water over the mounds. Therefore, those nests on relatively level areas are more adaptable to severe weather conditions of this nature than those on hillslopes or in canyons. At times the mounds may be covered with snow to a depth of from a fraction of an inch to several feet.

Storage of seeds. During late summer and early autumn and continuing until the overwintering state is fully in progress, the workers harvest and store large quantities of seeds from various annuals and perennials. In the Twin Falls area stored seeds are chiefly those of *Bromus tectorum* L. (Downey Brome-grass). These are placed in rather specialized nest chambers either in or below the mound. Table 1 lists the weights of seeds removed from chambers of a series of ten fully-developed mounds at the end of the harvesting period, together with the weights of seeds from chambers in ten similar mounds at the same locality in March, at the termination of the overwintering period.

The ants feed during the winter on the stored seeds. They do not, therefore, enter true hibernation, although activity is very slight, even on the warmer winter days, and consists chiefly of feeding. Because of this normal feeding the stock of stored seeds gradually diminishes, and by the time the workers venture from their nests in the spring only a relatively small proportion of the original supply remains. It is of interest that the writer has on no occasion observed a nest which did not possess at least a small quantity of seeds at the end of the overwintering period. Apparently the ants rarely, if ever, utilize their entire supply of stored food. The quantity is evidently ample and the remaining seeds, except those which sprout, are consumed by early spring feeding, from the end of the overwintering period to the time early annuals reach maturity.

After normal spring activity has begun the workers often carry many of the seeds to the mound surface where germination may begin. Occasionally some of the seeds germinate within the mound. The workers cut and remove the short plant growth so that the mounds and cleared areas surrounding them are completely denuded, in which condition they normally remain.

TABLE 1.

Weights of seeds in two series of ten representative mounds* of *Pogonomyrmex occidentalis* Cresson at Twin Falls, Idaho, October 29, 1932, and March 13, 1933.

Mound Number	Weights of Seeds, grams October 29, 1932						Weights of Seeds, grams March 13, 1933					
	Chamber 1	Chamber 2	Chamber 3	Chamber 4	Chamber 5	Totals	Chamber 1	Chamber 2	Chamber 3	Chamber 4	Chamber 5	Totals
1	42.3	12.8	1.2	14.5	1.3	72.1	0.0	2.1	0.0	4.8	0.0	6.9
2	5.6	2.0	3.4	1.8	2.4	15.2	1.4	3.6	1.2	5.1	0.0	11.3
3	7.4	6.3	1.3	0.2	2.5	17.7	0.0	0.0	8.5	0.0	0.0	8.5
4	9.8	1.0	0.5	2.4	4.6	18.3	5.0	0.0	0.0	0.8	0.0	5.8
5	36.9	24.3	13.6	6.9	2.6	84.3	0.3	1.2	0.0	4.0	0.2	5.7
6	1.4	0.0	9.2	16.8	8.7	36.1	0.6	0.8	1.2	3.1	0.4	6.1
7	21.1	11.7	1.9	5.5	3.0	43.2	2.6	8.6	5.1	2.0	0.0	18.3
8	14.3	9.6	2.8	1.8	3.5	32.0	0.0	2.3	0.0	1.8	0.0	4.1
9	6.9	1.4	2.9	12.6	8.3	32.1	2.2	0.0	1.9	0.0	1.0	5.1
10	5.2	7.1	19.1	10.2	4.7	46.3	5.8	0.1	0.6	0.0	0.1	6.6

*All mounds possessed five seed chambers and were selected for this reason.

Depth of colony. The bulk of the ants usually resides in a pocket about two feet beneath the base of the mound, although several greater and a few more shallow depths have been noted. The workers and the queen are massed together.

Nest temperatures. Table 2 lists temperatures at different levels in a series of five nests and their surrounding cleared areas during the overwintering period. There are decided differences between nest temperatures and those of the denuded areas. As in the case of soil moisture, which is discussed later, these differences may be produced by the relative porosity of the mounds and the denuded areas. The writer is unable to account for the rise in temperature from the eighteen to the twenty-one inch levels of the nests unless this represents an indication of the amount of heat produced by the ant cluster. This might be substantiated somewhat by the fact that the temperatures of the twenty-one and twenty-four inch depths in the nests were invariably higher than those at the same depths in the adjoining cleared areas.

Brood rearing. Brood rearing generally ceases about one month before the initial date of entrance of the ants into their winter quarters. The normal length of a single brood of workers of *P. occidentalis* averages about thirty days.[3] It is clear, therefore, that only in exceptional cases does a colony enter the overwintering state with brood yet in the nest chambers. In the insignificantly small number of cases when the overwintering colony includes brood which is not near the point of maturation, this brood usually dies in the early winter before any possibility of emergence. This may be caused by an insufficient

[3]Unpublished notes of the author.

supply of prepared food, to inadequate moisture conditions or to rather severe subsoil temperatures.

TABLE 2.

Temperatures at different levels in five mounds of *Pogonomyrmex occidentalis* Cresson, near Twin Falls, Idaho, December 27, 1932. One-half inch snow cover.

Depth	Temperatures of Nest, Degrees F.					Depth	Temperatures in Cleared Area, Deg. F.				
	Md. 1	Md. 2	Md. 3	Md. 4	Md. 5		No. 1	No. 2	No. 3	No. 4	No. 5
Apex of mound	40.0	39.5	39.5	39.5	39.0	6 in. above surf.	38.5	38.0	38.0	38.0	38.0
Center of mound	32.0	32.0	32.0	32.0	32.0	3 in. above surf.	38.0	39.0	38.0	38.0	38.0
Inner base of mound	32.0	31.5	32.0	31.5	31.5	Surface	35.0	35.0	35.5	35.0	35.5
3 in. below base	32.5	32.0	32.0	32.0	32.0	3 in. below surf.	33.0	33.0	33.5	33.0	33.0
6 in. below base	33.0	33.0	33.0	33.0	33.0	6 in. below surf.	32.0	32.0	32.0	32.0	32.0
9 in. below base	34.0	33.5	33.5	33.5	33.5	9 in. below surf.	32.0	32.0	32.0	32.0	32.0
12 in. below base	34.5	34.5	34.0	34.0	34.0	12 in. below surf.	33.0	33.0	33.0	33.0	33.0
15 in. below base	34.5	34.5	34.0	34.5	34.0	15 in. below surf.	33.5	33.0	33.0	33.0	33.5
18 in. below base	35.5	35.0	35.5	35.5	35.5	18 in. below surf.	33.5	33.0	33.5	33.5	33.5
21 in. below base	36.5	36.5	36.5	36.5	36.5	21 in. below surf.	33.5	33.5	33.5	33.5	33.5
24 in. below base	36.5	36.5	36.5	36.5	36.5	24 in. below surf.	33.5	33.5	33.5	33.5	33.5

Eggs are deposited by the queen at the time the colony breaks its semi-dormancy, usually in March. This brood matures after an interval of about six weeks, a longer period than is normally required apparently because of low temperatures and possibly because of a high subsoil moisture content.

Soil moisture. Table 3 shows the percentages of soil moisture in a mound of *P. occidentalis* and its denuded area near Twin Falls, Idaho, during the overwintering period.[4] The differences between the moisture contents of the two areas are rather distinct. The high percentage from the zero to the six-foot levels in the denuded area was induced primarily by a light coating of moist snow which was removed before the samples were taken. It is evident that the moisture content of the nest soil was significantly lower than that of the adjoining area.[5] This may have been caused by a greater degree of soil aeration because of the porosity of the mound material and the presence of the numerous galleries.

CONCLUSIONS.

Aestivation and the overwintering state of *P. occidentalis* are similar in that both are semi-comatose conditions apparently induced by certain seasonal or diurnal changes in weather, but differ because of the lack of feeding during aestivation, the slower approach to normal activity after overwintering and the usual lack of environmental conditions during aestivation which are likely to be toxic during overwintering. In the case of aestivation there is no preluding preparation—not even the nest entrances are closed, while a number of important

[4]These were secured by means of a three-foot soil tube.

[5]Care must be exercised in interpreting the table. The height of the mound was just six inches; therefore, the ground level of the mound area corresponding to the zero level of the cleared area would lie six inches below the mound apex. This accounts for the fact that samples in the cleared area were taken to only as great a depth as two feet.

changes occur before and during overwintering, such as storage of seeds, termination of harvesting and cessation of brood rearing. Entrance to aestivation is abrupt; to overwintering it is gradual. The period of aestivation is of an indefinite length. When *P. occidentalis* enters the overwintering state it remains in that condition until the following spring, changes in weather being relatively unimportant.

TABLE 3.

A comparison of soil moisture in a mound and cleared area of *Pogonomyrmex occidentalis* Cresson. Twin Falls, Idaho, January 2, 1933.

Soil Moisture in and Below Mound*		Soil Moisture in Denuded Area	
Depth of Sample	Percent Water	Depth of Sample	Percent Water
Apex of mound to 6 in. below	7.4	0 to 6 inches	16.9
6 to 12 inches	5.1	6 to 12 inches	6.5
12 to 18 inches	6.0	12 to 18 inches	6.9
18 to 24 inches	6.4	18 to 24 inches	7.6
24 to 30 inches	6.5		

*6 inches in height

SUMMARY.

P. occidentalis usually aestivates from about 11 a. m. to 3 p. m., or when the soil surface temperature is about 118°F., or higher. It does not aestivate on a cool summer day with soil surface temperatures of about 100°F. or lower. On abnormally cool days harvesting activity is greatest from 1 p. m. to 3 p. m. Another period, that from 3 p. m. to 9 p. m., often occurs. The nest entrances remain open. If worker ants are removed from the nest chambers during aestivation and are placed on the adjoining soil surface they return swiftly to their subterranean chambers about one foot below the base of the mound.

The overwintering period lasts, on the average, from the middle of October to the middle of March. During this time the ants are clustered in chambers approximately two feet below the base of the mound. Winter nest temperatures are consistently higher than those of the cleared area. Nest soils contain less moisture than those of the denuded area, possibly because of the greater porosity of the soil in the mound and nest. Egg deposition ceases about one month before the ants enter the overwintering state and only rarely does brood mature after the overwintering period is in progress.

Large quantities of seeds are stored by the worker ants for winter food, and a small percentage remains in the nests after the termination of the overwintering period. Some of the seeds which remain are transported to the mound surfaces where often they germinate. The plants are then cut and disseminated by the workers or the wind. The forces of nature, especially the wash of water, often damage or destroy mounds during the winter or in the early spring. The ants do not enter a true hibernating state because feeding activity occurs in the nest chambers. Soil temperatures, where the bulk of the ants overwinter, remain at about 36°F. During the winter mounds are often covered with snow to a depth of from a fraction of an inch to several feet.

LITERATURE CITED.

(1) Holmquist, A. M., "Hibernation of the Ant, Formica ulkei Emery." *Physiol. Zool.*, I, (1928) 325-357.

(2) McCook, H. C. The Honey Ants of the Garden of the Gods, and the Occident Ants of the American Plains. J. B. Lippincott & Co., Philadelphia, 1882.

TINGITOIDEA AFFECTING COTTON

BY F. A. FENTON,
Senior Entomologist, U. S. Department of Agriculture, Bureau of Entomology,
and
Texas Agricultural Experiment Station, Division of Entomology.

In May, 1933, my attention was drawn to a peculiar leaf injury to young cotton plants at Presidio, Texas. The leaves showed a striking reddish brown spotting from the upper side that at first glance resembled red-spider injury. The damaged plants were quite localized in one section of a large cotton field. Examination revealed the presence of large numbers of lace bugs present on the lower surface of the leaves. This species was identified as *Gargaphia iridescens* Champion by H. G. Barber of the U. S. National Museum. Gibson, 1919, records the food plants as *Ambrosia, Solanum, Malva,* and sand nettle. According to records in the U. S. National Museum, this species has been collected by McMillan at Brownsville, Texas, on *Solanum,* string beans, and *Ambrosia*; on egg plant at Olmito, Texas, by McMillan; on *Croton texanus* at Tucson, Arizona, by W. D. Pierce. It has also been recorded from Colorado, New Mexico, and Aguascalientes, Mexico. Mr. E. P. Van Duzee writes that this species has been collected by him from several localities in California, one host plant record being mint. So far as I have been able to ascertain, there is no previous record of this species feeding upon cotton.

The record of a lace bug feeding upon and injuring cotton was so unusual that further information of other species of this interesting group attacking cotton was sought. These data have been obtained through the courtesy of Mr. E. P. Van Duzee of San Francisco, California; Mr. H. G. Barber of Washington, D. C.; and Dr. C. J. Drake of Ames, Iowa. It was found that eight other species of *Tingitoidea* have been recorded as feeding on cotton, all in the New World. The following is a list of these species together with their geographical distribution and other host plant records:

FAMILY PIESMIDAE.

Piesma cinerea Say. Collected on cotton near Dallas, Texas. Barber notes that this record is of no particular significance as it is such a general feeder.

FAMILY TINGITIDAE.

Corythucha gossypii (Fab.) This species is recorded from southern United States, Central America, and the West Indies. It breeds on cotton and several other plants. Dr. M. D. Leonard and A. S. Mills have recently published a list of food plants[1] obtained from field records and from data on specimens in the

[1]Leonard, M. D., and Mills, A. S. Observations on the bean lace-bug in Porto Rico. Jr. Dept. Agric. Puerto Rico XV. July 1931.

U. S. National Museum. In addition to cotton it has been recorded from grape fruit, *Icthyomethia pispicula,* soursop, castor oil bean, *Prunus persica,* dahlia, Jatropha, beans, Papaya, *Canavalia ensiformis, Ricinus, communis, Solanum melongena, Solanum torrum,* Mango, Congo pea (*Cajanus indicus*), and a tree in Sonora, Mexico, called locally "Palo San Juan." According to Wilson[2] this species rarely damages cotton in St. Croix.

Corythaica costata Gibson. Collected on cotton at Santa Clara, Peru, by C. H. Tyler Townsend.

Gargaphia torresi Costa Lima. Collected in large numbers on cotton in Brazil and Argentina. Also recorded on bean. Breeds on cotton and an undetermined wild species of *Malvaceae* in Brazil according to records furnished by Dr. C. J. Drake. Specimens in the U. S. National Museum collected in the Argentine by Dr. G. Bondar and more recently by Max Kisliuk.

Gargahpia solani Heidemann. Recorded as occurring on cotton in Oklahoma Probably does not breed on this host, at least to any great extent. In describing species, Heidemann records it as collected on *Solanum carolinense* and *S. stacagnifolium* as well as coffee weed, egg plants, and potatoes. It has also been taken on *Amphiachyris* and *Salvia azurea* at Ardmore Texas, by Mr. F. C. Bishopp; on hollyhock at Pomaria, S. C., by J. A. Berly. The species is widely distributed in eastern United States and has also been recorded from the West Coast of Mexico. It is a pest of some importance upon the cultivated egg plant in United States.

Gargaphia subpilosa Berg. Breeding habits unknown. Collected on cotton and peas in Argentina, Bolivia, and Brazil. Berg remarks that it was collected on *Mikania auricularia.*

Gargaphia bimaculata Bondar (not Parshley)=*torresi* Costa Lima. Recorded as a pest of cotton in Brazil by Bondar. According to Drake, this species is synonymous with *G. torresi* Costa Lima. *Bimaculata* is not known to occur in South America, and the record as to species appears to be erroneous. Barber states in a letter to the writer that "several species such as *Gargaphia opaculata* Uhler, *G. condensa* Gibson, *G. iridescens* Champion, and probably *G. bimaculata* Parshley form a complex that, owing to their variability . . . . tend to make them very confusing." According to Drake "*bimaculata* Parsh. and *torresi* Costa Lima represent two quite distinct but closely allied species, which are not easily confused with other species."

Monanthia monotropidia (Stal.) Specimen in U. S. National Museum collection labeled "Collected on cotton," Pernambuco, Brazil. According to Drake feeds on *Cordia gerascanthus* L. in Cuba. Is widely distributed in Insular, Central, and South America. Recorded from Argentina, Colombia, Brazil, Panama, Mexico, Guatemala, Costa Rica, Jamaica, Cuba, and Haiti.

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[2]Wilson, C. E., 1923. Insect pests of cotton in St. Croix and means of combatting them. Bul. 3. Virgin Is. Exp. Sta. p. 9.

A NEW ATAENIUS FROM FLORIDA. (COLEOPTERA, SCARABAEIDAE).

BY O. L. CARTWRIGHT,*
Clemson College, South Carolina.

Ataenius miamii n. sp.

Oblong oval, convex, piceous opaque. Antennae and palpi rufo-testaceous.

Head moderately convex, densely punctate, the punctures across the occiput coarser, those of the front finer and united longitudinally in groups of two or more, single and still finer approaching the clypeus, the clypeus nearly smooth at middle. Clypeus impresseed in front, broadly emarginate, the angles broadly rounded, sides arcuate; genae obtuse, not prominent.

Thorax convex, one-third wider than long, sides sub-parallel, feebly arcuate, the edges partly hidden when viewed directly from above; angles obtuse, the hind angles especially so; base broadly arcuate, marginal line distinct; punctures rather coarse and close at base and sides, a little finer in front.

Elytra as wide at base as thorax, humeri dentate, sides arcuate, surface finely alutaceous under high magnification; striae moderately deep with rather coarse not closely placed punctures; intervals elevated along the middle, cariniform, the outer edge of each with a row of fine punctures each bearing a short yellowish scale-like hair, inner edge crenate.

Mesosternum closely punctate and bearing short semi-recumbent fine hair; finely distinctly carinate between the coxae. Metasternum shallowly confusedly punctate at sides, coarsely deeply more remotely punctate at middle, the punctures here separated by one to two or more times their diameters and bearing an extremely short scale-like hair. Abdomen finely alutaceous, shallow dense confused punctation at sides, middle more remotely punctate, the shallow punctures separated by one to two times their diameters. Abdominal segments crenate in front, the first visible segment margined posteriorly at middle, the last segment widely crenate at middle. Anterior tibiae acutely tridentate, first tarsal joint shorter than the next three. Middle and posterior femurs moderately punctate, punctures slightly deeper and more numerous at the knee, punctures bearing very short hairs; posterior femur with a series of four or five longer setae-like hairs near the knee; middle and posterior trochanters each with a single long bristle-like hair; posterior marginal line deep and entire. Posterior tibiae without accessory spinule; first tarsal joint equal to or greater than long spur and slightly longer than the next three joints together. Sexual differences not found.

Length, 3-3.7 mm.; width, 1.4-1.6 mm.

Mr. W. J. Brown of the Canadian Museum has kindly examined specimens of this species and agrees that it is close to *Ataenius imbricatus* Mels. It lacks the argillaceous coating of that species, however, is more convex, has the basal marginal line of the thorax distinct, and the intervals of the elytra cariniformly convex. From *Ataenius alternatus* Mels. it may easily be separated by its smaller more convex form and the cariniform intervals of the elytra being equal, not alternately higher.

Described from a series of 78 specimens collected by Mr. Frank N. Young

*Technical Contribution No. 36 from the South Carolina Experiment Station, Clemson College, S. Carolina.

at Miami, Florida, August 21, 1933. Type and two paratypes deposited in the U. S. National Museum. Paratypes in the Canadian National Collection and the private collections of Mr. Young and the writer.

A NOTE ON NOVA SCOTIA HETEROPTERA.

BY J. R. DE LA TORRE-BUENO,
White Plains, New York.

With his usual kindness Mr. C. A. Frost sent me the subjoined Heteroptera collected by him in Nova Scotia in July 1927 and 1929, at Portaupique and Westchester. The latest data available on bugs from this part are contained in Blatchley's Heteroptera of Eastern North America; the most extensive list thus far pubished is Parshley's 1923 paper, Records of Nova Scotian Heteroptera, which appeared in Proceedings of the Acadian Entomological Society for 1922, pp. 102, 108. The present records have been checked against these; the order of the species, for convenience, is that of Blatchley's Heteroptera.

Galgupha nitiduloides Wolff.—One from Portaupique, July 29, 1929. This was not recorded by Parshley from Nova Scotia, nor by Blatchley.

Sehirus cinctus Pal. Beauv.—Portaupique, July 27 and 28, 1927; July 31, 1929; recorded by Parshley from several localities.

Euschistus tristigmus Say.—Two from Portaupique, July 24, 1929; two from Westchester, July 27, 1929; this is another form with several records according to Parshley.

Cosmopepla bimaculata Thomas.—Portaupique, 2 July 20 and three July 23, 1929; Parshley gives several records.

Podisus serieventris Uhler.—Portaupique July 23, 1929, one, and Westchester, July 27, 1929, one; Parshley records this only from Kentville.

Podisus modestus Uhler.—Portaupique, July 22, 1929; Parshley gives several records of this species from the Island.

Meadorus lateralis Say.—One from Portaupique, July 24, 1929; Halifax is the only record cited by Parshley.

Corizus crassicornis L.—Portaupique July 26 and 27, 1929, three of this common holarctic species, widespread in Nova Scotia, sec. Parshley.

Ligyrocoris silvestris L.—Westchester, July 25, 1929, one only; Parshley gives several localities for this, but Blatchley omits its Nova Scotian records.

Eremocoris ferus L.—Westchester, July 29, 1927, one specimen; Blatchley omits Nova Scotia in his distribution of this species, although Parshley had recorded it from Kentvile, N. S.

Anthocoris musculus Say.—Portaupique, one each July 23 and 27, 1929; Parshley gives several localities for this under the name *borealis* Dall., which Blatchley omits.

Corythucha elegans Drake.—Four from Portaupique, July 27, 1929; a species not heretofore recorded from Nova Scotia.

Dictyonota tricornis americana Parshley.—One from Westchester, July 25, 1929; Parshley, in his original description gives three Maine localities, and records it later from Kings County and Truro, N. S.

Systelloderes biceps Say.—Two of these were secured by Mr. Frost, at Portau-

pique, one July 28 and the other 30th, 1927, "On River beach, among pebbles;" this is the first Nova Scotian record of the species.

Pagasa fusca Stein.—Portaupique, July 27, 1929, one of them macropterous; and another macropterous on the 30th; this is also a new record for the species.

Gerris dissortis Drake.—One from Portaupique, July 31, 1929; this and the next two species have not heretofore been recorded from Nova Scotia.

Gerris insperatus Drake.—Two from Portaupique, July 31, 1929.

Microvelia americana Uhler.—One from Portaupique, July 27, 1929.

ON FORBES' GROUPING OF AGROTINE GENERA*

BY J. MCDUNNOUGH,
Ottawa, Ontario.

In a recent paper entitled "A Grouping of the Agrotine Genera," by Dr. W. T. M. Forbes (1934, Ent. Am. XIV, pp. 1-41) there is considerable discussion of my "Generic Revision of North American Agrotid Moths," particularly in connection with what the author claims is my idea of the phylogenetic sequence of the genera. Now, while I value highly a number of Forbes' critical remarks and believe that his studies form an excellent check on my own work, I strongly object to being credited with statements which I had not made, due to either a careless reading or a misinterpretation of my text. A number of such misstatements have crept into Forbes' paper and I believe, therefore, that in justice to myself I may be permitted to call attention to these errors.

As stated in the first paragraph of my introduction the primary purpose of the revision was "to secure some better arrangement and grouping of the numerous North American *species.*" As regards genera I endeavored to employ the generic terms correctly, based on a study of the genotype "including (p. 15) under each individual head only those species which show an obvious similarity of genitalia." My main object, therefore, was to group the *species* into genera and *not* to indicate definitely any phylogenetic sequence of genera and I clearly stated this on page 19, noting that the sequence of genera was largely *"based on the spined or unspined nature of the fore tibiae."* Dr. Forbes in his foot note on page 1 would apparently credit me with stronger views on the subject of sequence of genera than I possessed; he states that "certain groups appear to be presented as natural in the discussion on p. 19" and follows this with a list of the groups. The grouping as given is in the main correct except in the last statement—"*Adelphagrotis* to *Pseudoglaea* and *Cryptocala* to *Pronoctua,* the two latter groups again taking up the *Euxoa* series." What I actually said (p. 20) is as follows—"*Adelphagrotis* again connects up with *Euxoa* section, ... whereas *Aplectoides, Anaplectoides, Protolampra* and *Pseudoglaea* show a modified *Agrotis* type of harpe"—and again—"*Cryptocala* and *Eueretagrotis* once more bring us back to the *Euxoa* group whereas the final group of genera, *Hemigraphiphora, Abagrotis, Rhynchagrotis* and *Pronoctua* present a modified and mostly reduced harpe of the *Graphiphora* type." It is surely quite obvious from this that there was no intention expressed of grouping the above genera into *two* related sections, as Forbes would have us believe; furthermore the position of *Pseudoglaea,* which

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

Forbes (p. 13) considers "badly misplaced," was due simply to the lack of fore tibial spines in the genotype and a consequent logical development of my stated plan. I quite agree that there is little connection between this genus and the *Rhynchagrotis* series but cannot, however, fathom the author's remark under *Pseudoglaea* (unless I have badly misunderstood it) that "the numerous spines on the penis are shared by *Eueretagrotis* alone"; *Pseudoglaea olivata* Harv. has the vesica armed with spindle-shaped bundles of very numerous small spines whereas in *Eueretagrotis sigmoides* Gn. the aedeagus is faintly (in other species more prominently) spiculate apically. Forbes further maintains that "the superficial special likeness of *Pseudoglaea* to *Mesogona* is hardly carried out in more important characters" but fails to note the presence in both genera of lateral conical proturberances on the tegumen, bearing the peniculus; this is, as far as I remember, a unique character and certainly seems to indicate a relationship. In spite of the above remark Forbes does, however, put both genera close together in his Group II.

Under the heading *Ochropleura* (p. 13) Forbes criticizes my "entirely different grouping" (due incidentally and almost entirely to the nature of the spining of the fore tibiae) in the section; he states he "cannot see the connection of *Metalepsis* and *Cerastis, Hemipachnobia* and *Paradiarsia* at all." The statement is rather ambiguous and leaves us guessing whether the "connection" is with *Ochropleura* in Group II or merely among the named genera themselves; if the former a reference to my next to last paragraph on page 19 would emphatically show that no such connection was ever indicated; if the latter it would be interesting to have an explanation of why these same four genera are included in Group IV which the author (p. 8) states is "plainly homogeneous, and hardly needs more than a single genus."

In conclusion it might be well to state that I agree with Forbes' placing of his Group V as non-Agrotine and on the whole am in accord with his remarks as to the probable primitive genera of the Agrotine moths (pp. 15-17); when preparing my own Revision it also appeared to me that *Peridroma* especially represented a very ancestral form and I indicated this in a mild way on page 47. Forbes' method of arriving at his conclusions regarding generic relationships is ingenious but whether it will stand the acid test remains to be seen; it has the obvious fault, to my mind, of being too mechanical, and the assignment of *equal* value to all sharply defined characters on the ground that "at present we have no reason for assuming any one character is more important than another in the series" (p. 3) might be very seriously questioned. The remarks on the morphology of the clasper (pp. 28, 29) (harpe of my revision) and its relation to the ampulla and pollex are also most interesting but can hardly be considered as conclusive without an examination of much more material; a detailed investigation, however, into these parts would probably prove well worth while.

THREE NEW SPECIES OF SCOLYTIDAE (COLEOPTERA)*

BY J. M. SWAINE,
Ottawa, Ont.

Xyleborinus tsugae n. sp.

Length 2.5 mm., width 1.1 mm. Pronotum and elytra equal in width, sides straight and parallel, elytra arcuately narrowed on the caudal third, very broadly obtuse behind; dark reddish brown; pubescence sparse, erect and yellow, more evident about the apex of the pronotum and on the elytral declivity.

The head has the frons broadly, feebly convex, the median line feebly carinate with a narrow, transverse epistomal impression, the entire surface subopaque from minute reticulations, marked with sparse, coarse, shallow punctures with minute setae on the caudal half, more finely and closely granulate-punctate in front, the punctures bearing long yellow hairs erect on the frons, longer and recumbent from the transverse impression, forming the epistomal fringe, the epistomal margin smooth, narrow and feebly elevated; the eyes with a deep triangular emargination.

The pronotum is slightly longer than wide, 2.4:2, the sides parallel, hind angles broadly rounded, broadly almost evenly arcuate in front, the anterior declivity steep, finely somewhat concentrically asperate, the asperities minute and concentric near the summit, which is slightly elevated, the lines of asperities continued behind the summit as indistinct concentric lines, so that the summit is surrounded by several concentric lines, asperate in front; smooth and subopaque behind the summit and minutely, feebly, not very closely, punctate, not distinctly planate on the middle line behind the summit as in *saxesceni,* the smooth median line of the caudal half hardly discernible; the pubescence fine but rather long and erect in front and about the sides.

The elytra are much longer than wide, 3.6:2, shining, the sides nearly parallel on the anterior two-thirds, slightly narrower at the extreme base, gradually, arcuately narrowed from behind the middle and very broadly rounded behind, subtruncate at the apex; the elytral striae feebly impressed, strial punctures moderate and close on the disc and sides, in regular rows throughout; the discal interspaces feebly convex, the sutural interspace more strongly so than the others, planate towards the base and corrugated in a V-shaped marking behind the scutellum, the punctures uniseriate, much smaller and nearly as numerous as those of the striae, minutely granulate on the caudal half becoming distinctly granulate near the declivity, the interstrial punctures on the sides less regular and nearly as coarse as those of the striae. The *declivity* opaque, steep, convex, 1st, 3rd and 4th interspaces distinctly convex and armed with small granules extending from the posterior third of the elytra nearly to the apex, becoming sparse near the apex on the 1st and 3rd, those of the 4th more numerous and forming the circular serrate margin of the declivity when viewed from behind, the 2nd convex and granulate at the summit of the declivity becoming gradually less convex but *the row of granules extending half way to the apex,* the 1st and 2nd striae feebly impressed on the declivity, the rows of punctures regular and separated throughout, the punctures distinct, those of the

*Contribution from the Division of Forest Insects, Entomological Branch, Dept. of Agric., Ottawa.

1st striae extending to the apex, the terminal granule on each side of the apex larger than the others; the pubescence fine, yellow, erect, rather long and distinct about the side margins and on the declivity.

The scutellum is minute and sub-conical. The venter is smooth and shining, very finely punctate, more distinctly and coarsely on the three terminal sternites.

Holotype—♀, Mission, B.C., VI-6-32, *Tsuga heterophylla,* (G. R. Hopping) No. 3815 in the Canadian Collection.

Paratypes—6♀, same data.

Xyleborinus librocedri n. sp.

Length 2.5 mm., width .8 mm.; pronotum narrowly rounded in front; sides subparallel; elytra as wide as the pronotum at the base, slightly wider at the middle; pubescence yellow, slender, erect and more distinct on the declivity of the elytra.

The head has the frons feebly convex, minutely reticulate and subopaque, marked with sparse, moderate, shallow punctures, the median line slightly elevated, the epistoma feebly impressed without a more prominent median tooth.

The pronotum is slightly longer than wide, 50:41; the sides subparallel, feebly arcuate on the caudal three-fifths, the hind angles rounded, *the sides strongly narrowed on the anterior two-fifths and very narrowly rounded at the apex,* the summit two-fifths from the apex, the disc shining, feebly punctate, median smooth line very narrow, indistinct.

The elytra almost twice as long as the width at the base, 37:20; slightly wider at the middle, arcuately narrowed on the caudal half, the caudal margin subtruncate across the middle line; disc of elytra shining, striae feebly impressed, 1st stria slightly stronger, strial punctures moderate and shallow, interstrial punctures minute, feebly granulate. The *declivity* subopaque, 1st and 3rd interspaces granulate, feebly but distinctly convex, 2nd interspaces with granules only at top of declivity, narrowed on the declivtiy forming the bottom of a feeble sulcus, punctures of striae 1 and 2 distinct but shallow, interspaces 4, 5, 6 and 7 with a few granules on the sides of the declivity, those of 7 ending at the most prominent acute granule at the junction of the 3rd and lateral interspaces opposite the end of the 2nd interspace.

Holotype—♀, Oak Ridge, Ore., V-31-24, *Librocedrus decurreus;* (G. Hopping); No. 3816 in the the Canadain National Collection.

Paratypes—3♀, same data.

Phloeosinus piceae n. sp.

Length 2.2 mm.; width 1.3 mm. Black with short erect reddish pubescence, antennae and tarsi reddish; closely allied to *P. pini* Sw.

Head: In the female the front is subplanate with a feeble, arcuate transverse impression, closely rather coarsely granulate, punctation indistinct, pubescence very fine, with a very fine median carina on the epistomal margin and a small, indistinct, post-marginal callosity on each side, the median epistomal process small, but semicircular and emarginate; (in the *male* the front is coarsely granulate-punctate, with a large, deep, subcordate impression occupying more than half the space between the eyes, and a strong median carina extending from the depth of the impression to the epistomal margin; the median

epistomal process minute, lunar and entire); the antennal club elongate-oval, the "sutures" bisinuate, subtransverse on the outer half, strongly recurved toward the base on the inner third.

Pronotum; in the *female* slightly longer than wide, 2.5:2, rather strongly constricted in front on the sides, the constriction continued across the dorsum as a strong post-marginal impression, the punctation close, moderate, and subgranulate, coarser than *pini*, with a smooth median line very narrow and incomplete; (in the *male* decidedly wider than long, 2.2:1.5, strongly constricted in front, with the median line more distinct).

The *elytra* are stout, longer than wide, 4:3; scutellum depressed, striae narrow and impressed, strial punctures narrow, elongate and deep; interspaces moderately convex, with coarse and fine granules, the coarser nearly uniseriate on the disc, uniseriate, sparser, and acute on the declivity, closer and more numerous near the base. 2nd interspace wider, elevated and densely granulate near the base. The *declivity* in the *female* with interspaces convex, 2nd not perceptibly narrower or less elevated than 1st and 3rd, with a single row of acute granules; (in the *male* 1st and 3rd interspaces slightly more strongly convex, the 3rd with distinctly coarser granules).

The venter is sparsely punctate, the mesoternum precipitous in front, elevated at the anterior angle into a short compressed process between the coxae, perpendicular in the female, narrower and less ridge-like than in *pini*.

This species is closely allied to *pini* Sw. and in a long series they may intergrade. I have seen only one pair of each. The chief differences are that in *piceae* the head of the male is much more strongly excavated, the pronotum much more coarsely granulate-punctate and more closely on the anterior half, apparently slightly relatively at the base and less strongly constricted in the female. The pubescence on the elytra in *piceae* is distinct on the disc, shorter on the declivity but each seta much longer than its width, and rather abundant, with the interstrial row of longer hairs distinct, whereas in *pini* the pubescence is minute and scale-like, sparse even on the declivity, with the hairs of the interstrial row very fine and indistinct. The rugosities on the anterior half of the elytral interspaces are distinctly more numerous in *piceae*.

Described from two specimens collected by Mr. E. B. Watson from a tunnel in a white spruce twig, on Berry Mountain, Brook, Cascapedia River, Que.

Holotype: ♀, Gaspe Co., Que., *Picea canadensis*, Aug. 2, 1933, (E. B. Watson); No. 3817 in the Canadian National Collection.

Allotype— ♂, same labels.

A CONTRIBUTION TO THE INSECT FAUNA OF TIMAGAMI

BY A. W. A. BROWN,
Department of Biology, University of Toronto.

Lake Timagami is the centre of one of the few extensive pine forests of the Canadian Zone which still remain. The virgin conditions of half a continent make their last stand against lumbering and settlement in such regions as this; a study of its fauna seems, therefore, imperative to Canadian biologists.

This collection, of which a list follows, was made in the summer of 1932. though unfortunately no collecting was done during the period from June 12

to July 21. No attempt at life-history notes is made, but macro- and micro-habitat of the adult are recorded where possible. Localities are indicated by initials and described separately.

With regard to relative abundance of the different orders and families, this collection greatly understresses the Chironomidae and allied families, Formicidae, Plecoptera, Lepidoptera and the ectoparasites; comparatively overstressed are Orthoptera, Odonata and Syrphidae. Bear Island, be it noted, does not represent virgin conditions, but the early stages of settlement.

Very hearty thanks are due to those specialists who have co-operated in the identification of specimens. The names of these will be found in the text in the accounts of the various orders.

LOCALITY DESCRIPTIONS.

B.I. Bear Island.

Laboratory. White frame structure on southern slope facing lake, with screened verandah in front. In the middle of small clearing with a good growth of grass, *Taraxacum, Ranunculus, Achillea, Rubus idaeus,* and scattered Hazel and Mountain Maple.

Ball-field Trail. Passes through a pure stand of Balsam. As it approaches Ball-field is bounded by low hazel shrubs, *Pteris,* and *Aster* spp.

Ball-field. Level grassy clearing of 1-2 acres. Borders, especially on south side, densely covered with Solidago. One of the warmest spots in the district. Open Young Woods of W. Birch, Red Cherry and Aspen surround Ball-field, on its eastern side 20 acres in extent. Many grassy open spots, with scattered Compositae.

Tower Trail. Extension of Ball-field Trail up the southern face of the hill on which the fire-tower stands; through a young mixed stand with scattered old Red and White Pine; at the top it grades into Jack Pine, with many open spots.

Cemetery Point. Narrow point of land immediately east of the village; Red Pine stand, with scattered Birch and Balsam understory.

D.B. Deer Bay, High Rock Island. Small bay (1-2 acres), fairly well protected, divided into 3 parts. Water deep (6′-12′) but shoaling to shore in two places, where grow *Nymphaea, Potamogeton* etc. with Sedges and *Triglochin* on the soft soil landward. Typical habitat of *Somatochlora williamsoni* (W.E.R.)

D.L. Devil Lake. Collecting in bay of western shore, in fairly dense stand of Spruce, Balsam and Cedar.

E.B.I. East End of Bear Island. Mature White Pine stand, with well developed understudy of Mountain Maple; ground cover dominated by Aster and Aralia; moist as a whole, variegated with sunny spots. The South-Eastern point of the island is rocky, with Red Pine stand and ground cover of Vaccinium,—fairly dry and sunny.

E.B.I. Trail. Some times called Telephone Trail, being the route of the Forestry Branch communication with Timagami. Right-of-way cut through mature Pine, giving a sunny strip some 20′ wide, with borders of dense Hazel, and some flowers. At one point it debouches on a sandy beach at the head of a bay facing south.

E.C. Eileen Creek. Small warmish creek, rapid and slow alternately, flowing through mixed woods. (W.E.R.)

F.R.B. Forma Rosea Bay. Small concealed inlet on west coast of McLean peninsula, opposite the Skunk Lake portage; good growth of lily pads.

G.L.P. Gull Lake Portage. Passes through a dense stand of mature Pine, with Cedar in low areas; like most Timagami portages, it is mown, giving a border of *Aster* and *Aralia*.

High ridge north of G.L.P. is a steep rocky slope facing east, with Jack Pine at its summit.

G.L.T. Gull Lake Torrent. Swift stony stream, volume 1-2 cu. ft./sec. (August), warmish; flows through mostly coniferous woods. (W.E.R.)

Garden Island. Level, and cleared in spots on western side; under almost pure stand of White Birch, other species being cut out.

H.R.I. High Rock Island. Collecting on western shore,—rocky with scattered Jack Pine.

I. 315. Level island of some 6 acres, under Balsam, with Cedar, Birch and Aspen. In places Mountain Maple is well developed. Conditions moist and shady, herbaceous plants sparse.

I. 340. Collecting at west end of island, in clearing with Southern aspect bounded by young Birch woods. Dry and sunny, with good growth of tall grass, *Anaphalis* and *Solidago*.

I.B. Island Bay. Collecting on rocky shore with scattered Jack Pine.

I.B.C. Island Bay Creek.

a) Flows from mixed woods, rather slow and shallow, volume 0.1 cu. ft./sec. (Prob'ly only *Boyeria*).

b) Flows over short stony section into open boggy ground (*Sympetrum* spp. and *Somatochlora walshii*).

c) Long open bog section, very slow, 20′ wide, and weedy in spots (*Somatochlora elongata, Aeschna* spp. and *Sympetrum* spp.) (W.E.R.)

K-K-K.B. Ko-Ko-Ko Bay. Collecting on Eastern shore, fairly rocky with Jack Pine stand.

L.B. Loon Bay. Collecting in a bay on the west side near the entrance, very shallow and densely covered with lily pads; also at the head of the bay, among scattered tall reeds, notable for *Donacia* spp.

L.L.P. Portage Loon Bay to Loon Lake. Passes through second growth Spruce, with moist and shady conditions; trail bordered largely by *Aster*.

McB. The MacBeth-Clement township line immediately north of Bass Lake. Represents the north-eastern tip of the McNish Fire (May 1932) where it passed from the cut-over area in MacBeth into mature White Pine in Clement.

P.B. Portage Bay. Collecting on eastern shore of Portage Peninsula, in second growth Jack Pine, with Balsam and Birch,—fairly moist and shady.

Portage Peninsula: referring to Black Spruce swamp at its northern end; very open, with dense growth of *Chamaedaphne, Ledum* and *Cassandra*.

S.C. Spawning Creek. Small shallow stream with wide rocky bed, bordered by Cedar; sunny and sheltered. Dense banks of *Osmunda regalis* and *Eupatorium* in places.

Sp.L.P. Spawning Lake Portage. Parallels the creek on its western side. Passes mostly through low areas under Cedar, but on higher ground there is mature Pine with Mountain Maple; *Aster macrophyllus* throughout.

S.L.P. Skunk Lake Portage. Collecting at its Eastern (Timagami) end, and a gradual slope under second growth Aspen, fairly open, with much Aster.

S.P. "Sand Point." A point from the eastern shore of the North Arm, just north of Garden Island. Has a narrow beach of fine gravel facing S.W., backed by Alder. Behind it is an open Black Spruce swamp, recently filled up, with *Carex* in the centre, grading outwards through *Chamaedaphne* and *Vaccinium* to Spruce and Tamarack.

Surface of L.T. (Lake Timagami). Hot windless weather with frequent thunderstorms characterized June 4, 5, and 6. Swarming insects, chiefly Coleoptera, would fly far out over the lake, to drop into the calm, and therefore probably invisible, water.

T.I. Timagami Island.

Red Pine type, on a point of land at the N.W. end; very little herbaceous growth and fairly deep humus layer. Farther inland Mountain Maple develops.

White Pine slope, a quarter-mile down the western shore; a gradual slope facing N.W., with young Birch and *Alnus mollis,* and very scattered Pine.

T. Inn. *Timagami Inn.* Clearing, with western aspect, in front of the hotel; very dry and sunny, with long Grasses; a cement walk runs through the centre, which may become very hot.

W.L. Watson Lake. A small inland muskeg lake, some 500′ across, reached by striking north from the long Gull Lake Portage about 1000′ from the Timagami end. Northern and western shores are open muskeg, up to 200′ wide, grading into Black and White Spruce. The eastern shore is rocky, under Red Pine.

COLLEMBOLA.

Identified by Hedley G. James, Dominion Parasite Laboratory, Belleville, Ontario.

PODURIDAE.

1. *Achorutes armatus* Nic. Aug. 26. B.I. In gills of Agaric fungus Russula foetens.

ENTOMOBRYIDAE.

2. *Isotoma leonina* Pck. Aug. 4. K-K-K.B. Under bark of dead Jack Pine.
3. *Tomocerus flavescens* Tull. Sept. 19. I. 315. On skinned mouse dead four days.
4. *Tomocerus vulgaris* Tull. Aug. 19. B.I. In dust indoors.
5. *Entomobrya clitellaria* Guth. Aug. 20. T.I. Under bark of dying Red Pine.
6. *Entomobrya ontariocnsis* James. Sept. 3. T.I. In White Spruce, dead 1-2 years.
7. *Lepidocyrtus cyaneus* Tull. Sept. 1. B.I. On Red Pine woodpile.

ORTHOPTERA.

From the collection of Dr. E. M. Walker made in 1908, and described in Canadian Entomologist 41. 137-178. Only one addition,—*Chorthippus curti-*

pennis. My own 1932 specimens,—all adults, identified by Dr. E. M. Walker, Department of Biology, University of Toronto.

TETTIGONIIDAE.

1. *Scudderia pistillata* Brunner. "Generally distributed in open swamps and heath-bogs, but not numerous. In large open bog on Diamond Lake, covered almost entirely with Ericaceous shrubs, this was the only species of Orthoptera encountered." (E.M.W.)
2. *Conocephalus fasciatus* DeG. "Occasionally met with in long grass growing in sphagnum bogs." (E.M.W.) ♂ Sept. 2. T. Inn. In long grass. (A.W.A.B.)
3. *Ceuthophilus pallidipes* E. M. Walker. Timagami Falls. Immature ♀ inside tent. No other specimens could be found (E.M.W.).

GRYLLIDAE.

4. *Gryllus assimilis* Fabr. "Common on Bear Island and occurring in small numbers in many parts of the Timagami District (E.M.W.). ♀ Sept. 10. B.I. On sand in Ball-field. (A.W.A.B.).
5. *Nemobius fasciatus abortivus* DeG. "Abundant on Bear Island and occasionally met with elsewhere in the district." (E.M.W.). ♀ Sept. 11. B.I. In long grass. (A.W.A.B.).

ACRIDIDAE.

6. *Chorthippus curtipennis* Harr. ♂ July 24. G.L.P. Aug. 22 I. 340: in grass (A.W.A.B.)
7. *Stethophyma lineatum* Scudd. ♂ Sept. 11. Marsh on Obabika Creek (E.M.W.).
8. *Camnula pellucida* Scudd. "Common in open rocky or sandy places in the district." (E.M.W.). ♂ July 25. S.L.P. ♀ July 27. B.I. along Ball-field trail. (A.W.A.B.).
9. *Pardalophora apiculata* Harr. "Shore of Diamond Lake, Sept. 7, a few nymphs (Stad. 3) taken on a dry bushy hillside. This spot was in a rough clearing on which a few trappers' huts stood." (E.M.W.).
10. *Dissosteira carolina* Linn. "Common on the clearings and roadsides on Bear Island, and occasionally met with in dry open places on the portages." (E.M.W.). ♂ and ♀ Sept. 2. T. Inn. On Sunny cement walk. (A.W.A.B.).
11. *Circotettix verruculatus* Kby. "Generally distributed and abundant on all exposed rocky or otherwise barren surfaces of any considerable area, especially in burnt-over districts. In the unburnt or uncleaned parts it was only occasionally met with, and generally in very small numbers." (E.M.W.). ♂ Aug. 1. B.I. In Ball-field. Sept. 2, T. Inn. In grass. Sept. 16. I.B. on moss. (A.W.A.B.).
12. *Podisma glacialis canadensis* E. M. Walker. Obabika Portage Sept. 13. 1 ♂. Portage at upper end of Cross Lake. Sept. 3. 1 ♂. Portage between Cross and Timagami Lakes. Sept. 4. 1 ♂. Taken from spruce trunk and bushes. Seems to be, on the whole, quite scarce and local. (E.M.W.).
13. *Melanoplus atlanis* Riley. "Abundant in the fields and pastures on Bear Island." (E.M.W.).
14. *Melanoplus bivittatus* Say. "Moderately common in the district. All the

examples seen were red-legged,—femoratus (E.M.W.). July 25 B.I. Inside laboratory July 22 and Aug. 21. B.I. Outside of laboratory (A.W.A.B.).

15. *Melanoplus fasciatus* Walk. "A few taken in the district. A single macropterous ♀ was taken from the edge of the heath-bog on Diamond Lake." (E.M.W.).
16. *Melanoplus femur-rubrum* DeG. "Common in fields on Bear Island and frequently met with in small numbers in clearing and open swamps in other parts of the district." (E.M.W.). 2 ♂ and 1 ♀ Aug. 22. I. 340. In grass. (A.W.A.B.).
17. *Melanoplus islandicus* Blatch. "Occasionally found in bushy clearings or openings on portages in the woods, always in small numbers." (E.M.W.).

ACRYDIIDAE.

18. *Nomotettix cristatus sinuifrons* Hancock. 2 ♀ s Sept. 7. Shore of Diamond Lake. Strip of nearly dry sandy soil with scattered blueberry bushes. (E.M.W.).
19. *Acrydium acadicum* Scud. race *brunneri.* 1 ♂ Sept. 2. Near Temagami Falls; macropterous, from a small opening on a portage through mixed white pine, spruce, balsam, white birch, etc. (E.M.W.).
20. *Acrydium granulatum* Kby. 1 ♀ Sept. 11. Portage between Lakes Obabika and Timagami. (E.M.W.) June 6. E.B.I. Sandy shore in bay facing south. (A.W.A.B.).

NEUROPTERA.

Identified by Nathan Banks, Museum of Comparative Zoology, Harvard, Massachusetts.

POLYSTOECHOTIDAE.

1. *Polystoechotes punctatus* Fab. Aug. 6. B.I. Inside laboratory (10.00 p.m.).

CHRYSOPIDAE.

2. *Chrysopa ypsilon* Fitch. June 3. B.I. In long grass in shady spots.

EPHEMEROPTERA

Identified by F. P. Ide, Department of Biology, University of Toronto.

EPHEMERIDAE BAETINAE.

1. *Choroterpes basalis* Bks. Aug. 19. B.I. On painted wood near lake shore. Sub-imago also.
2. *Blasturus cupidus* Wlk. June 6. E.B.I. In open white pine type.

HEPTAGENINAE.

3. *Ecdyonurus tripunctatus* Bks. B.I. Aug. 16 ,17, 21, on painted wood; also on sugar on painted wood 10.00 p. m. Sept. 1. S.P. in black spruce swamp. Also series of 16, Aug. 7 to Sept. 1, '32.

(To be Continued.)

OBITUARY

FREDERICK STEPHEN CARR.

Frederick Stephen Carr was born January 1st, 1881, the son of Stephen and Mary Nichols Carr of Cobourg, Ontario. He received his elementary education in the Front Road School near Cobourg, his high schooling in the Cobourg Collegiate Institute, and he graduated in 1904 from the University of Toronto with honors in Natural Science.

He undertook the work of teaching in the Province of Alberta, his experience centering mainly at Innisfail and Edmonton. From 1919 until the time of his death which occurred on May 15, 1934, he was in the service of the Department of Education of the Province of Alberta as Inspector of Schools, located latterly for twelve years at Medicine Hat. In 1907 he was married to Miss Laura Moyer who had been a fellow staff member of the Innisfail School. In addition to Mrs. Carr, four children are bereaved by Mr. Carr's passing, Stephen Frederick, senior medical student in the University of Alberta; Mary, a member of the teaching staff of the Medicine Hat public schools; Beth (Mrs. Robert Simpson) of Tilley, Alberta, and John, still in his senior public school years.

Mr. Carr was an only boy and as a result of the inaccessibility of playmates he early formed the habit of wandering through field and wood in search of new friends amongst Mother Nature's children; as his interests deepened, he began to acquire, with what little money a farmer's boy could command, literature and equipment which would assist in broadening his activities within his chosen avocation, the study of Natural History in general and insect life in particular. These interests, developed in early life, deepened with maturity. For several years he taught Science and Natural History in the Summer School for Teachers held at the University of Alberta; hundreds of teachers in Alberta have appreciative recollections of the interests developed through Mr. Carr's teaching and his enthusiasm for his chosen avocation of observing and recording animate phenomena was communicated to large numbers of his students. In addition to his teaching work Mr. Carr made concrete contributions to the science of Entomology. He not only became a Coleopterist known across the continent, but also amassed one of the outstanding beetle collections and a most complete library covering Natural Science in general and Entomology in particular.

In 1920, Mr. Carr published his first list of the Coleoptera of Alberta. In each subsequent year he added to this list through the medium of the Entomological Record, and, at the time of his death, his lists included over 1,400 species. Of these over 95% had been collected by himself with the assistance of his sons.

Of these species he donated over 900 to the University of Alberta in which Institution the Coleoptera collection is a monument to his energy and generosity. In addition, he collected extensively in other orders.

Although he collected, and recognized as such, many new species he was content to allow others the credit of naming most of them. Several of these have been named in his honour. His own publications, which have appeared from time to time in this Journal, were devoted chiefly to taxonomic studies in Dytiscidae, in which family he was particularly interested.

Mr. Carr's personal library and collection will remain in the family as the possession of his youngest son, John, a lad already absorbed in the pursuit so ably carried on by his father.—H. A. M.

Mailed Saturday, Oct. 6, 1934.